Banco Central de Chile
Documentos de Trabajo

Central Bank of Chile
Working Papers

N° 652

Diciembre 2011

CAPITAL CONTROLS AND FOREIGN EXCHANGE POLICY

Marcel Fratzscher

BANCO CENTRAL DE CHILE

CENTRAL BANK OF CHILE

La serie Documentos de Trabajo es una publicación del Banco Central de Chile que divulga los trabajos de investigación económica realizados por profesionales de esta institución o encargados por ella a terceros. El objetivo de la serie es aportar al debate temas relevantes y presentar nuevos enfoques en el análisis de los mismos. La difusión de los Documentos de Trabajo sólo intenta facilitar el intercambio de ideas y dar a conocer investigaciones, con carácter preliminar, para su discusión y comentarios.

La publicación de los Documentos de Trabajo no está sujeta a la aprobación previa de los miembros del Consejo del Banco Central de Chile. Tanto el contenido de los Documentos de Trabajo como también los análisis y conclusiones que de ellos se deriven, son de exclusiva responsabilidad de su o sus autores y no reflejan necesariamente la opinión del Banco Central de Chile o de sus Consejeros.

The Working Papers series of the Central Bank of Chile disseminates economic research conducted by Central Bank staff or third parties under the sponsorship of the Bank. The purpose of the series is to contribute to the discussion of relevant issues and develop new analytical or empirical approaches in their analyses. The only aim of the Working Papers is to disseminate preliminary research for its discussion and comments.

Publication of Working Papers is not subject to previous approval by the members of the Board of the Central Bank. The views and conclusions presented in the papers are exclusively those of the author(s) and do not necessarily reflect the position of the Central Bank of Chile or of the Board members.

Documentos de Trabajo del Banco Central de Chile
Working Papers of the Central Bank of Chile
Agustinas 1180, Santiago, Chile
Teléfono: (56-2) 3882475; Fax: (56-2) 3882231

Documento de Trabajo
N° 652

Working Paper
N° 652

CAPITAL CONTROLS AND FOREIGN EXCHANGE POLICY

Marcel Fratzscher
European Central Bank

Abstract

The empirical analysis in the paper suggests that an FX policy objective and concerns about an overheating of the domestic economy have been the two main motives for the (re-)introduction and persistence of capital controls over the past decade. Capital controls are strongly associated with countries having significantly undervalued currencies. Capital controls also appear to be less motivated by worries about financial market volatility or fickle capital flows per se, but rather by concerns about capital inflows triggering an overheating of the economy – in the form of high credit growth, rising inflation and increased output volatility. Moreover, countries with a high level of capital controls, and those actively implementing controls, tend to be those that have fixed exchange rate regimes, a non-IT monetary policy framework and shallow financial markets. This evidence is consistent with capital controls being used, at least in part, to compensate for the absence of autonomous macroeconomic and prudential policies and effective adjustment mechanisms for dealing with capital flows.

Resumen

El análisis empírico de este trabajo sugiere que un objetivo de política cambiaria y la preocupación por un sobrecalentamiento de la economía nacional han sido los dos principales motivos para la (re)introducción y persistencia de los controles de capital durante la última década. Los controles de capital están fuertemente asociados con los países que tienen significativamente subvaluados sus tipos de cambio. Los controles de capital también parecen estar menos motivados por las preocupaciones sobre la volatilidad de los mercados financieros o de flujos de capital volubles per se, que por las preocupaciones sobre los flujos de capital que provocan un sobrecalentamiento de la economía –en la forma de un fuerte crecimiento del crédito, un aumento de la inflación y de la volatilidad del producto. Por otra parte, los países con un alto nivel de controles de capital, y controles implementados de forma activa, tienden a ser aquellos con tipo de cambio fijo, un régimen de política monetaria sin meta de inflación y mercados financieros poco profundos. Esta evidencia es coherente con los controles de capital utilizados, al menos en parte, para compensar la ausencia de políticas macroeconómicas autónomas y prudenciales, y mecanismos efectivos de ajuste para hacer frente a los flujos de capital.

Prepared for the 15th Annual Conference of the Banco Central de Chile on "Capital Mobility and Monetary Policy". I am grateful to Norman Loayza, my discussant, and conference participants for comments and discussions, and Bogdan Bogdanov for excellent help with the data preparation. Views expressed in this paper are those of the author and do not necessarily reflect those of the European Central Bank. E-mail: Marcel.Fratzscher@ecb.int.

I. Introduction

The question whether capital controls should be part of the tool box of policy-makers to deal with capital flows has become one of the central issues in the international economic policy debate. It has been one of the key policy issues in the G20 under the French Presidency in 2011, and has been covered extensively by the IMF and other international institutions and fora. However, despite a G20 commitment to arrive at "coherent conclusions" on capital flow management, only limited progress has been made so far.

One reason for the slow progress is that there are few policy issues that have been as controversial as the one on the desirability of capital controls. One side of the debate argues that financial liberalization and integration are a key foundation for global prosperity and growth, with capital mobility and access to foreign capital being an important source for investment and the diversification of risk. On the other hand, in particular policy-makers of some emerging market economies (EMEs) have been emphasizing the risks stemming from unfettered capital flows for the macroeconomic and financial stability objectives of their countries.

Looking at all these arguments in favor and against capital controls, four overarching motives for the use of capital controls have emerged in the recent policy debate: an FX policy objective; a capital flow management goal; a financial stability aim; and a macroeconomic policy objective. First, authorities may pursue capital controls with an FX policy objective in mind, i.e. to maintain a stable exchange rate that is not overvalued, and thus does not impinge on the competitiveness of the domestic economy. Critics of capital controls and those pointing at the presence of "competitive devaluations" have gone even a step further and argued that capital controls have in some cases been actively used to achieve or maintain undervalued exchange rates.

Second, policy-makers goal with the pursuit of capital controls may be related to capital flows, i.e. to reduce both the volume and volatility of capital flows, and to lower the share of relatively more risky portfolio flows. A third objective discussed in the policy debate is that of financial stability: policy-makers may maintain or implement capital controls in order to shield the domestic economy and financial institutions from volatile capital flows and avoid an overheating and over-reliance on foreign capital. Under the fourth, real economy objective, capital controls of countries may reflect concerns about the real economy (growth, growth volatility, inflation or public debt) or external vulnerability (current account, external debt).

The purpose of the present paper is to test the empirical validity of these four hypotheses. Which of these four objectives is the primary motive for capital controls? The paper starts by identifying the characteristics of countries with high levels of capital controls and what makes these countries different from those with free capital mobility. The paper uses a broad set of macroeconomic and financial variables to gauge, for a broad set of 79 economies over the period 1984-2009, which of the four hypotheses are most important for understanding which countries maintain a high level of financial restrictions and which have few restrictions.

In the second step of the analysis, the paper then tries to explain the factors that cause policy-makers to *actively change* the level of capital controls. Which of the four hypotheses explains best why some policy-makers impose or raise capital controls, and which why others reduce them?

The third element of the analysis is based on an event study which investigates the evolution of macroeconomic and financial variables around changes – increases as well as reductions – in capital controls. How are countries raising controls different from those that lower them or keep them unchanged? And what is the experience of countries in the years after changing capital controls relative to others?

Addressing these questions is challenging, partly because of the complexity of the various factors that may induce policy actions, and partly due to methodological difficulties in identifying causes and effects. The paper takes a different approach from much of the literature which focuses on the effects or effectiveness of capital controls. The main goal of the present paper is not to analyze the effects of controls, but to identify which motives induce policy makers to adopt them in the first place; irrespective of whether or not they are then successful in achieving their objectives. This more modest objective allows also averting some of the difficult issues related to identification and in particular to endogeneity of the introduction of capital controls; a more detailed discussion follows below. The capital control measures employed are those developed by Chinn and Ito (2011) as well as Schindler (2009), which are proxies for the de jure financial openness of countries.

Overall, the empirical findings of the paper suggest that an FX policy objective has been an important if not dominant motive of capital controls globally. Countries with higher levels of capital controls tend to have undervalued (real effective) exchange rates. The undervaluation of the exchange rate is the single most important variable explaining a larger share of the difference in the level of capital controls across countries than any other variable in the analysis. Moreover, countries with undervalued exchange rates are more likely to raise existing capital controls further, especially since 1999. The event study analysis suggests that the degree of undervaluation increases in the years following large rises in capital controls. In addition, countries with high exchange rate volatility do not only tend to have significantly higher levels of capital controls but are also more likely to raise controls.

Yet there is another important dimension to the link of capital controls and FX policy, which relates to the exchange rate regime and the monetary policy regime of a country. Reducing the volatility and magnitude of capital flows through administrative controls makes it considerably easier for a central bank to maintain a fixed exchange rate regime. Conversely, countries having a flexible currency regime and an inflation-targeting monetary policy regime are less likely to need capital controls to achieve their policy objectives. The findings of the empirical analysis are consistent with this argument, as countries with flexible exchange rate regimes and those with an inflation targeting (IT) regime tend to be more open financially. Moreover, since 1999 countries with inflation targeting regimes have much more frequently reduced existing capital controls than non-IT countries.

By contrast, there is no compelling evidence in the data that either the level of or changes in capital flows per se are an important motive for capital controls: countries

with larger capital flows – if measured relative to the overall size of countries' economies – are those that have more open capital accounts. Moreover, countries that have raised capital controls in the past have tended to be countries with a comparatively lower level and volatility of capital flows. This evidence is corroborated by the event study, which shows that in particular net portfolio flows decline in the years following significant increases in capital controls.

The evidence also uncovers only a mixed link between financial stability objectives and the level and changes in capital controls. Countries with deeper financial markets are those with a lower level of capital controls and are also less likely to raise capital controls. Moreover, countries with more financial stress (in bond, equity and money markets) in prior years tend to have lower levels of controls and are more likely to liberalize their capital account in subsequent years.

By contrast, in particular countries with high growth rates in the credit to the private sector are significantly more likely to raise capital controls. This variable on credit growth turns out to be one of three most important variables accounting for cross-country differences in capital controls. Moreover, also countries with high inflation and high volatility in GDP growth are more likely to raise capital controls. Taken together, this suggests that concerns about an overheating of the economy, rather than purely financial market or asset price concerns, guide the decisions of policy-makers to raise capital controls.

Many of these empirical links identified are present either only or are particularly strong for the period since 1999, consistent with the argument that the 1997-98 Asian crisis may have constituted a more fundamental change in the objectives of policy-makers, in particular with regard to exchange rate policy objectives.

In sum, the findings of the paper suggest that an FX policy objective and concerns about an overheating of the domestic economy have been the two main motives for policies of capital flow management over the past two decades, and in particular in the 2000s. Capital controls – both the level and the likelihood of raising existing controls further – are strongly associated with countries with fixed exchange rate regimes and significantly undervalued exchange rates. As to the financial stability side, the evidence suggests that capital controls are less motivated by worries about financial market volatility, but rather by concerns about capital inflows triggering or contributing to an overheating of the economy – in the form of high credit growth, rising inflation and output volatility. Finally, the paper also uncovers evidence that suggests that capital controls have externalities across countries as countries are found to be more likely to raise controls when other countries in the region have done so recently.

These findings have a number of policy implications. A first important point is that capital control measures seem to be used not in a purely defensive manner when it comes to FX policy – the presence and introduction of capital controls are not merely associated with avoiding an appreciation or overvaluation of the domestic currency, but rather are linked to a significant undervaluation of the exchange rate. This suggests that the concerns by policy-makers about "competitive devaluations" and "currency wars", which have become so prominent in recent years, may not be unfounded. The competitive motive behind capital controls is moreover strengthened

by the finding that countries are more likely to raise controls when neighbouring countries have done so recently as well.

As a second point, the evidence is consistent with the argument that capital flow management (CFM) policies are used to compensate for the absence of autonomous macroeconomic and financial policies and effective adjustment mechanisms. The fact that countries with a high level of capital controls, and those actively implementing controls, tend to be those that have fixed exchange rate regimes, have a non-IT monetary policy regime, and have shallow financial markets indicates that policy-makers need to use capital controls to try and protect their economies against capital flows. Although the size of the capital flows is rather modest relative to the overall size of the economy in countries with higher capital controls, their effect on the domestic economy (credit growth, inflation and output volatility) tends to be large when other policy tools than capital controls, and deep financial markets to absorb those flows, are absent.

The fact that countries with high capital controls exhibit a worse performance with regard to credit growth, inflation and output volatility – and introducing (additional) controls does not seem to lower these overheating pressures systematically in subsequent years – makes it very hard to see capital control measures as a first-best policy option. Instead, financial market development and the creation of policy frameworks allowing for autonomous and credible macroeconomic and prudential policies may constitute a superior path to shield the domestic economy from fickle capital flows. Of course, capital flow management policies are seen by some as temporary measures to "buy time" for policy-makers to enact more fundamental macroeconomic and prudential reforms. Yet a risk is that such policies not only create domestic and international distortions, but reduce incentives for policy makers to pursue such deeper reforms. The persistence or frequent re-introduction of capital control measures suggest that this risk may not be unfounded.

Several caveats have to be emphasized. Most importantly, one needs to be very cautious in interpreting the relationships identified here as establishing a causal link. Not only are countries with different levels of capital controls different in a multitude of ways, but the introduction of capital controls is never a random event and may be triggered by factors not covered by those analyzed here. The approach of the present paper attempts to avoid these pitfalls as its primary objective is not to assess the effects or effectiveness of capital controls, but rather by analyzing and identifying differences in factors in the past, which are linked to decisions by policy-makers to maintain or changes in capital controls today.

The paper proceeds by outlining the main arguments of both supporters and critics of capital controls in the current policy debate, and by reviewing some of the underlying academic literature, in section 2. Section 3 then describes the empirical methodology and the data used for the empirical analysis. Section 4 outlines the four main hypotheses to be tested and discusses the empirical findings. In the final section 5, the findings are summarized and implications for policy are drawn.

2. The pros and cons of capital controls

Much of the recent policy debate has focused on the question under what circumstances capital controls may constitute a useful policy tool.[1] This issue has become so important in this debate because of the experience in particular of emerging market economies (EMEs) with capital flows during and after the 2007-08 financial crisis. The sudden collapse of capital flows to and capital flight from many EMEs in the second half of 2008, and the subsequent surge in 2009 and 2010, put a lot of strain on domestic economies and financial markets in many EMEs.[2]

A helpful framework through which to consider the issue is in terms of market distortions and market failures: if markets work efficiently, capital is allocated optimally and any control on capital flows implies a distortion. Hence much of the policy discussion about the potential role of capital controls has concentrated on the question under which market failures capital controls may be welfare improving.

A first type of distortion is related to international market failures. For instance, many EME policy-makers have argued that excessively loose monetary policy in the US and other advanced economies since 2009 has been "pushing" more capital into EMEs than warranted by underlying economic fundamentals. Other international distortions or market failures may relate to contagion and herd behavior of international investors which trigger excessive, temporary capital flows into some EMEs. Capital controls may thus reduce the adverse effects of such distortions on the domestic economies receiving excessively large capital inflows. In short, capital controls may play a useful policy role of capital flows are excessive, temporary and primarily due to "push factors", i.e. factors that lie outside the control of domestic policy makers – so the line of reasoning.

The second type of distortion or market failure that capital controls may be used to deal with are domestic in nature. Domestic distortions frequently emphasized have a macroprudential and microprudential origin: capital flows may exacerbate existing financial fragilities in economies that are particularly vulnerable, i.e. which have less financial development and depth, and weaker institutions for dealing with financial stability issues. Other domestic fragilities may relate to the balance sheets of domestic firms and households, which may be adversely affected by large fluctuations in capital flows.

Taking the perspectives of both types of distortions, several policy-makers have argued that capital controls may thus be seen as a macroprudential policy tool as much as a macroeconomic policy tool. Looking at the whole set of available policy

[1] The IMF has conducted substantial work in recent years on the issue of capital controls and their role in the policy mix, in particular in emerging markets, providing a number of papers that nicely outline the state of the debate and some underlying evidence – see Ostry et al. (2010, 2011) and Chamon et al. (2011).

[2] There is a rapidly growing literature discussing various elements of this experience, including on the drivers of capital flow cycles (sudden stops, reversals, surges and retrenchments) with a specific focus also on the 2007-08 crisis and its implications – see Forbes and Warnock (2011), Aizenman and Sushko (2011), Calvo, Izquierdo and Mejia (2011), Raddatz and Schmukler (2011) and Fratzscher (2011). There is also a growing literature linking capital flows to contagion and the cross-border transmission of shocks – see e.g. Broner, Gelos and Reinhart (2006) and Bekaert, Ehrmann, Fratzscher and Mehl (2011).

tools, capital controls may become an even more important tool in the pecking order of policies when other policies are constrained or not available at all. In particular, using an exchange rate appreciation as a buffer against a capital inflow surge is less feasible if an exchange rate is already overvalued, and if an economy already lacks competitiveness. Also using FX interventions to absorb inflows is less desirable if foreign exchange reserves are already high and exceed what is needed for purely pre-cautionary motives.[3]

Moreover, the desirability of using capital controls to deal with capital flow fluctuations may depend on the space of monetary policy and fiscal policy. For instance, lowering interest rates to discourage capital inflows may not be a feasible policy option in an economy that has high inflation and is concerned about overheating. Similarly, fiscal policy tightening to reduce demand and counteract a surge in capital inflows may not be an option if fiscal policy is already tight and public debt high.

In a nutshell, this has been the general reasoning of many proponents in favor of capital controls as a policy tool in the current debate. On the contrary, those who caution against the use of capital controls tend to point out that capital controls in many cases are not a first-best solution, but rather an inferior alternative to needed policy reforms – e.g. an improvement in macro- and microprudential supervision and regulation and a deepening of financial markets to deal with financial stability risks from capital flow fluctuations; an improvement in institutions and a reform of macroeconomic policy frameworks (in particular with regard to monetary policy, fiscal policy and exchange rate regimes); and the move towards flexible exchange rate regimes to obtain fully autonomous monetary and fiscal policies.

In addition to being inferior policy responses, so these critics, the imposition and maintenance of capital controls may in fact delay those needed reforms, with substantial longer term costs to the domestic economy. Moreover, there is a huge literature investigating whether capital controls have been effective at all in dealing with capital flow fluctuations.[4] The findings in the literature do not yield compelling evidence in favor of an effectiveness of capital controls, although a consensus is emerging that while capital controls are easily circumvented and thus may not have a substantial effect on the volume, they appear to change the composition of capital flows towards less risky and volatile types of flows.

There is also compelling evidence that capital controls of individual economies can have adverse externalities and consequences for the global economy – triggering calls for closer cooperation of capital flow management policies at the global level, in particular through the G20 process. One such externality occurs through exchange rate management: if capital controls are used in order to maintain or induce undervalued exchange rates, such a measure obviously comes at the expense of lower competitiveness of that country's trading partners. In fact, following the 2007-08

[3] For a discussion and evidence on the link between capital controls and exchange rate policy, see for instance the recent work by Jeanne (2011).

[4] For an overview of this literature and its findings see the excellent surveys of Magud, Reinhart and Rogoff (2011), Forbes (2007), Cardarelli, Elekdag and Kose (2009) and one for the 1980s and early 1990s by Calvo, Leiderman and Reinhart (1996). Henry (2007) provides a review of the broader experience with capital account liberalization.

financial crisis there has been a heated debated about some EMEs engaging in "competitive devaluations", or "currency wars" as Brazilian Finance Minister Mantega called it, due to countries using FX interventions and capital controls to weaken their currencies. The massive increase in FX reserve holdings as well as the widespread introduction of capital controls by EMEs are indications consistent with this argument.

Another externality is that the imposition of controls in one country may make it politically more attractive and induce the adoption of similar controls by others, thus overall leading to serious impediments to financial globalization.[5]

A third type of externality may result when the introduction of capital controls induces a diversion of capital flows to other countries. For instance, there is evidence that the introduction and raising of capital controls on portfolio inflows by Brazil in 2008-11 has caused a significant diversion effect and increase in capital inflows into other Latin American economies and also other EMEs outside Latin America.[6] Such externalities can be particularly strong for small EMEs when the economy imposing controls is as large as Brazil's. Overall, this case highlights the importance of pursuing and adopting a coordinated approach to capital controls.

3. Methodology and data

This section starts by outlining the empirical approach for testing the four overarching potential motives for the use of capital controls, as stressed by the recent policy debate and outlined above: an FX policy objective; a capital flow management goal; a financial stability aim; and a macroeconomic policy objective.

Importantly, the main intention is to identify the factors that distinguish countries according to their choice of capital controls, both the overall level of de jure restrictions maintained by a country, as well as the decision to either raise or lower existing controls. To identify the factors $X_{i,t}$ of country i that relate to the level of capital controls (CC), the benchmark model to be estimated is formulated as

$$CC_{i,t} = \alpha_t + \mu\, X_{i,t-1} + \varepsilon_{i,t} \tag{1}$$

while the benchmark model to relate factors to the choice of changes in capital controls is

$$D_{i,t}^{CC} = \alpha_t + \lambda\, X_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

$D_{i,t}$ is a dummy variable with $D_{i,t}=1$ if a country raises capital controls in year t and $D_{i,t}=0$ if it keeps existing controls unchanged. In a second model specification, the

[5] See Prasad, Rogoff, Wei and Kose (2003) for a compelling overview of the arguments and underlying evidence on financial globalization. Many other benefits from financial globalization have been analyzed in the literature, in particular with regard to the diversification of risk and for investment (e.g. Curcuru et al. (2011), Hau and Rey (2005), Gelos and Wei (2005), and Rajan (2010)).

[6] Forbes, Fratzscher, Kostka and Straub (2011). Korinek (2010) provides a conceptual presentation of externalities and capital flows.

estimation is conducted for cases when capital controls are lowered, so that $D_{i,t}=1$ if a country lowers capital controls in year *t* and $D_{i,t}=0$ if existing controls stay unchanged. Equation (1) is estimated via OLS and equation (2) using a logit specification.[7]

Moreover, three types of models are estimated. In a first step, each individual factor $X_{i,t}$ is included separately ("individual models"); in a second step, all factors of a particular hypothesis are included together ("combined model"); and in a third step, an encompassing procedure reduce the model specification in a stepwise way so as to arrive at the model that includes only those factors that are statistically significant at least at the 20% level ("encompassing model").

Both models include time effects α_t so as to take into account that there is a general, common time trend in capital controls with capital controls generally decreasing over time, as will be discussed and shown below. The inclusion of time dummies in equation (2) is less obvious, yet in turns out that in particular the (re-)introduction of capital controls clustered in a few particular years of the sample.[8] Robust standard errors are reported throughout.

An important issue is the potential endogeneity of capital controls. As discussed above, much of the literature focuses on the effect of capital controls on various macroeconomic and financial variables which raises the concern that such an effect cannot be cleanly identified since capital controls are likely to be a direct or indirect, endogenous result of the very same variables. This problem does not arise here as the analysis is interested in the question of merely characterizing and identifying those factors that are associated with differences in the level and changes of capital controls. However, the potential problem is that these factors may themselves be influenced by capital controls. The analysis tries to partly address this concern by analyzing past values of these factors, i.e. including the lagged values of the factors $X_{i,t-1}$. Of course this does not entirely solve the problem as both dependent and independent variables may be persistent over time; thus one needs to be careful when interpreting the parameter estimates in a causal way.[9]

The third part of the empirical analysis is an event study of the behavior of the factors X_i in the years before and after changes in capital controls. The main interest for this analysis is to understand whether fundamentals in countries raising capital controls in a particular year differ from those countries that kept controls constant and those countries that lowered existing controls. The identification of countries raising,

[7] In alternative specifications, equation (1) is estimated allowing for censoring at the lower bound, as a number of observations of the dependent variable, as discussed below, lie at the lower/zero value of the dependent variable. Results are very similar to those using a linear OLS specification, with the OLS estimation being the ones shown below as parameter estimates are more easily interpreted. Moreover, equation (2) is alternatively estimated using a multinomial logit specification, which allows estimating both models (the one for increase in capital controls, and the one for lowering in controls) in a single model, though yielding identical parameter estimates.

[8] As one would expect, empirically the inclusion of time effects matters little in the estimation of equation (2), but is crucial for equation (1).

[9] Various approaches have been employed in the literature to deal with the endogeneity issue of capital controls, such as using instrumental-variable approaches. However, these approaches are not free of pitfalls either, in particular as it is inherently difficult to identify appropriate instruments. Another challenge relates to the non-stationarity of the dependent variable in equation (1). Various test statistics are used to check, and confirm, the stationarity of the residuals.

lowering and keeping constant their controls is the same as for equation (2) above. Again, the potential endogeneity of capital control policies means that the relationships identified in this event study should not be interpreted to imply causality.

Table 1

The analysis is conducted for a broad set of 79 countries, using annual data, for the period 1984-2009. Table 1 shows the countries included in the sample, indicating that the sample is dominated by emerging market economies, which constitute about half of the countries. The sample and time period are mainly determined by data availability of the capital controls variables.

A key issue is the measurement of capital controls, which is inherently difficult. The capital control measures by Chinn and Ito (2011) as well as Schindler (2009) are used here to proxy the de jure financial openness of countries. Importantly, both are de jure measures, thus providing indications about the intentions of policy makers rather than the actual outcome or de facto openness and integration of countries. The former proxy has a broader coverage and a longer time series, hence it is the preferred measure in the analysis, although various robustness checks show that the empirical findings are very similar when using other proxies for de jure openness.[10] Both proxies are scaled so that a higher value indicates a higher degree of capital flow restrictions.[11]

Figures 1 – 2

Figure 1 plots the evolution over time of the average degree of capital controls as well as the standard deviation of controls across countries at any point in time. The figure shows compellingly the overall trend towards fewer controls and more liberalization, although the dispersion across countries remains significant throughout the period and even rises towards the end of the 2000s. This is a powerful illustration that cross-country differences in capital controls globally have never been as dispersed as they are today.

Figure 2 shows the share of countries which raised capital controls, the share that lowered controls and the one that kept controls unchanged during a particular year. The figure reveals an interesting pattern, with sharp increases in capital controls occurring in many countries during the second half of the 1990s – during and following the Asian crisis, as well as in 2009 – after the global financial crisis of 2007-08. What is striking is that 2009 was the first year since the mid-1980s during which more countries raised capital controls than countries lowering them.

Tables 2 – 3

[10] There are various strengths and advantages to the measure proposed by Schindler (2009), in particular its greater detail and break-down of individual types and categories of capital controls. The main interest for the present paper is the dimension that refers to restrictions of the capital account, which is used for the analysis, although also this measure is highly correlated with the Chinn-Ito measure. Moreover, a feature exploited for some of the analysis here is the distinction of the Schindler proxy between restrictions on capital inflows and controls of outflows.

[11] For simplicity reasons, the paper uses throughout the term "capital controls", though strictly speaking the proxies include restrictions e.g. on FX or current account transactions.

Finally, a broad set of potential proxies is used to test the 4 hypotheses discussed above. Table 2 provides an overview of the definition of the variables, while Table 3 gives some summary statistics. Note that for the empirical analysis below, all factors are normalized to have a zero mean and a standard deviation of unity in order to make the parameter estimates more easily comparable across variables.

As to the hypothesis that capital controls are related to FX policy, seven FX variables are analyzed. A first key variable is the degree of exchange rate misalignment, so as to test whether having an undervalued or overvalued exchange rate is associated with a different level of capital controls and whether or not it triggers active decisions by policy-makers to raise or lower existing restrictions. The main measure of FX overvaluation used stems from behavioral (BEER) and fundamental (FEER) equilibrium exchange rate models for real effective exchange rates. As this variable is an important focus of the present paper, several alternative proxies for FX misalignment are used and based on deviations from a linear trend or from period averages of real effective exchange rates (REER), nominal effective exchange rates (NEER) and bilateral exchange rates vis-à-vis the main anchor currencies. While the estimates shown below are based on the FX overvaluation measures from the structural BEER and FEER models, those estimates are robust to using such proxies of misalignments from trend.[12]

Other FX policy variables that policy-makers may react to in their decision about capital controls are the past trend appreciation of the REER, the short-term, three-month money market interest rate differential vis-à-vis the anchor currency country, and the exchange rate volatility (measured as the standard deviation of monthly REER movements during the previous year). Recall that all these variables are included in the model estimation of equations (1) and (2) are based on lagged values (the previous year) so as to take into account that e.g. changes in capital controls are likely to affect FX variables themselves contemporaneously.

In addition, the test of FX policy hypothesis also includes the level of FX reserves as a share of GDP, a dummy for the exchange rate regime (taking the value of one if a currency is classified by the IMF as being freely floating) and a dummy for whether countries have an inflation targeting (IT) monetary policy strategy (taking a value of one if the country is using an IT strategy). The priors are that countries with a floating exchange rate regime and an IT regime are more likely to also have fewer restrictions on capital flows. The prior for FX reserves is more difficult to gauge. On the one hand, FX reserve accumulation and a fixed exchange rate regime may be complements as both may be used to stabilize the country's currency. This would imply also that more reserves are linked to more capital account restrictions. On the other hand, FX reserves and capital account openness may be negatively correlated, e.g. a country with a closed capital account may not need to intervene heavily in FX markets to stabilize the domestic currency.

As to the second hypothesis, the capital flow hypothesis, the level, the change and the volatility of capital flows are used as proxies to gauge whether capital controls are

[12] Data for REER and NEER stem from BIS and IMF. Bilateral exchange rates are mostly taken vis-à-vis the US dollar, with the exception for European currencies, for which the euro that is taken as anchor currency.

related to fluctuations in capital flows. Overall capital inflows and outflows (portfolio flows plus other investment flows, which mostly includes bank loans) as well as more narrowly net portfolio flows are analyzed in the empirical test. Changes in flows are percentage changes relative to the previous year; the volatility of flows the standard deviation of monthly flows.

Note that all capital flow proxies are measured as a share of domestic GDP. This is an important point to keep in mind because when e.g. people talk about "excessive" capital flows, they may have different benchmarks in mind. For instance, a given volume of capital inflows may not be large overall when measured against the overall size of the economy, but these flows may be very large when compared to the size of the domestic financial sector. The reason for normalizing flows by GDP is to be able to distinguish the size of capital flows per se from the importance of other factors and characteristics, which are analyzed separately under the financial stability hypothesis below.

Third, a number of alternative proxies are used to test for the role of a financial stability objectives of capital controls. Institutional indicators of financial sector development as well as the stock market capitalization relative to GDP are employed as two alternative proxies for financial market depth and development of a country. The prior is that policy-makers are more likely to maintain a higher level of capital controls or raise capital controls when the domestic financial sector is more shallow, so that external and domestic shocks more readily may have an adverse effect on the domestic financial system and the domestic economy.

As a second dimension, the analysis tests for the role of financial stress; the prior being that higher financial stress should be positively correlated with capital control measures. The IMF's financial stress index (which is a composite of returns and volatility in equity, bond and money markets) as well as specifically equity market volatility (standard deviation of monthly returns) are used as proxies. Third, to get at the role of overheating and asset price bubbles, the analysis includes credit growth (the change in credit flows to the private sector, relative to GDP) as well as the change in domestic equity returns as well as the deviation of equity returns from period averages (equity valuation) are included as proxies. The prior here is clear, with more financial stress or asset price rises in the previous year expected to be positively related to capital controls.

As to the fourth and final hypothesis, the role of the real economy and external stability for the choice of capital flow management measures, the GDP growth rate, GDP growth volatility (standard deviation of quarterly growth rates over the past two years), the CPI inflation rate, the current account to GDP ratio, trade openness (exports plus imports over GDP), as well as the ratio of public debt to GDP and of external debt to GDP are included. Most priors as to the relationship with capital controls are clear with regard to these proxies, possibly with the exception of trade openness. One the one hand, more trade openness may imply that a country is more exposed to external shocks, hence potentially providing an incentive for domestic policy-makers to try and shield the domestic economy from such shocks by restricting the mobility of capital into and out of the country. One the other hand, there is solid evidence in the literature that capital flows "piggy back" trade, i.e. there is a positive relationship between both for financing reasons of trade and for risk-sharing motives.

4. Testing the four hypotheses – the empirical results

This section presents and discusses the results, going systematically through each of the four hypotheses in turn.

4.1 FX policy

The analysis first turns to the role of FX policy as a motivation for capital controls. Table 4.A presents the estimates of equation (1) for the level of controls, while Table 4.B shows the estimates for equation (2) for the changes in controls. The last columns of each table indicate the conceptual prior about the expected signs of the coefficients, based on the discussion in the previous section.

Recall from above that for each hypothesis three types of models are estimated and presented: "individual models" including each factor separately; a "combined model" capturing all factors of a particular hypothesis together; and an "encompassing model" that includes only those factors that are statistically significant at the 20% level.

Table 4

Overall, there is significant evidence that the level and changes in capital controls are related to FX policy. In particular, there is a close link between the undervaluation of exchange rates and capital control policies. Since 1999, an undervalued exchange rate is associated with a higher level of capital controls. Moreover, countries with undervalued exchange rates are more likely to have raised capital controls since 1999.

Capital controls are also significantly related to other elements of concern for FX policy: higher REER volatility is associated with a higher level of capital controls (especially since 1999) and is more likely to trigger an increase in capital controls. Similarly, a trend depreciation of the REER is also linked to both a higher level and a lower probability of policy-makers reducing capital controls since 1999.

There is another key dimension that connects capital controls and FX policy, namely the exchange rate regime and the underlying monetary policy regime of a country. Managing to contain the volatility and volume of capital flows through capital controls may make it easier for policy-makers to maintain a fixed exchange rate regime. Countries having a flexible currency regime and an inflation-targeting monetary policy regime are less likely to need capital controls to achieve their policy objectives. The findings of the empirical analysis are consistent with this argument, as countries with flexible exchange rate regimes and those with an inflation targeting (IT) regime tend to be more open financially. Moreover, since 1999 countries with inflation targeting regimes have much more frequently reduced existing capital controls than non-IT countries.

Table 5 and Figure 3

How important are these effects overall? Table 5 tries to gauge the relevance of the various factors by looking at the interdecile range of the marginal effects. Concretely,

the table displays how much the capital control measure, on average, is explained by differences in each of the factors analyzed when comparing countries with a value of a factor at the 10th percentile of the entire distribution (of countries and over time) with countries with a value of the same factor at the 90th percentile of the distribution. For instance, a country with a high degree of overvaluation at a particular point in time (i.e. at the 90th percentile of the FX overvaluation variable) has a level of capital controls which is, on average, 2.55 lower than a country with a low degree of overvaluation (i.e. a high degree of undervaluation – at the 10th percentile of the FX overvaluation variable). The value of 2.55 is about one full standard deviation of the capital control level variable; hence overall a quite sizeable magnitude.

Figure 3 provides a visualization of the relationship of FX overvaluation and the level of capital controls, and the same fore the FX volatility variable. Especially for FX overvaluation there is quite a decent fit in the relationship between overvaluation and capital controls across countries and over time.

Figure 4

For the event study, Figure 4 shows the evolution of four of the FX policy variables around changes (either increases or reductions) in capital controls. In particular, the event study indicates that the degree of undervaluation increases in the years following large rises in capital controls. Moreover, countries with high exchange rate volatility do not only tend to have significantly higher levels of capital controls but are also more likely to raise capital controls.

What is also striking is the evidence for inflation targeting. Countries with IT regimes are much more likely to reduce capital controls than keep them constant. By contrast, countries that raise capital controls tend to go even in the opposite direction by being less likely to have an IT regime in the years after raising capital controls.

Tables 6 – 8

Finally, a battery of robustness tests is conducted to check for the sensitivity of the estimates. Table 6 presents the benchmark estimates when using the alternative capital control measure by Schindler (2009). The table indicates that the estimates are qualitatively very similar to those using the Chinn-Ito measure. Next, Table 7 provides estimates when splitting controls on inflows from controls on outflows. The findings overall are qualitatively very similar for controls on inflows and outflows. Also distinguishing across country groups (Table 8) does not yield systematically different findings, though of course some coefficients may lose or gain significance in alternative models. Several other robustness tests were conducted that are not shown here for brevity reasons.[13]

In summary, the evidence shown points quite strongly towards FX policy motives, in particular with regard to maintaining undervalued exchange rates, being an important

[13] For instance, one of the strengths of the Schindler measure is that it allows distinguishing between controls across different types of investment. Again, the estimates did not show a pattern that would point at systematic differences across categories. Moreover, also equation (2) for changes was estimated using these alternative capital control proxies with similar empirical findings as for the presented benchmark results, and the same holds for the estimates for the other three hypotheses.

objectives behind capital control policies, both for maintaining a high level of capital controls and for raising the likelihood to raise capital controls at times.

4.2 Capital flows

The section turns next to analyzing the potential role of the second hypothesis, namely whether and to what extent capital flow management policies are influenced by a capital flow objective.

Table 9 and Figure 5

Overall, Table 9 indicates that there is no compelling evidence that either the level of or changes in capital flows per se are an important motive for capital controls. In fact, higher levels of gross capital inflows, gross capital outflows and changes in net portfolio flows are associated with a lower level of capital controls (Table 9.A). Moreover, having experienced higher capital inflows, portfolio inflows or net portfolio flow volatility in the previous year reduces the probability of countries raising capital controls (Table 9.B).

These findings underline the importance, as discussed in detail above, for being cautious in not interpreting these findings necessarily in a causal way. Importantly, countries with high capital flows are likely to be different in many other ways from countries with a relatively lower volume and/or volatility of capital flows. Specifically, capital flows here are measured relative to the size of the domestic economy, rather than the size e.g. of the domestic financial sector. As discussed above, this has been a deliberate choice in order to distinguish the size and volatility of capital flows per se from other potential factors influencing the choice of capital controls, such as related to financial stability objectives.

Nevertheless, an important finding emerging from the analysis here is that there is no systematic evidence that links a larger magnitude and a higher volatility of capital flows per se with more capital flow restrictions. This evidence is corroborated by the event study of Figure 5, which shows that in particular net portfolio flows decline in the years following significant increases in capital controls.

4.3 Financial stability

The third hypothesis relates to the role of financial stability objectives for policy-makers to choose a capital control regime.

Table 10 and Figure 6

The evidence shown in Table 10 uncovers an ambiguous relationship between financial stability objectives and the level and changes in capital controls. Countries with deeper financial markets are those with a lower level of capital controls and are also less likely to raise capital controls. This holds for both proxies of financial market depths, the institutional indicator employed (“financial depth”) and the market based measure (“Stock market capitalization”).

Second, countries with more financial stress (in bond, equity and money markets) in prior years tend to have lower levels of capital controls and are also more likely to liberalize their capital account.

Third, the evidence is much stronger for the role of credit growth. Here the findings suggest that countries with high rates of credit growth to the private sector in the previous year not only have a higher level of capital controls, but are also more likely to raise existing controls further. Table 5 indicates that this effect is indeed economically meaningful as the credit growth variable is one of the three most important variables in terms of magnitude explained of the differences in the level of capital controls across countries and over time.

The event study of Figure 6 indicates that credit growth is not only higher in prior years for countries deciding to raise capital controls than for those lowering controls or keeping them constant, but credit growth also declines markedly during and after the (re-)introduction or raising of capital controls.

Overall, the evidence on financial stability suggests that it is not financial market stress that motivates decisions about raising and maintaining high levels of capital controls, but it is rather the rate of credit growth that is linked to capital control measures. This points rather to policy-makers' concerns about an overheating of the real economy than about financial markets per se.

4.4 Real economy and external stability

As to the fourth and final hypothesis, the analysis now turns to the role of real economy and external stability objectives for capital control measures.

Table 11 and Figure 7

The evidence of Table 11 indicates that countries with high inflation and high volatility in GDP growth both have a higher a level of capital controls and are more likely to raise existing capital controls. By contrast, countries that are more open to trade tend to have lower levels of capital controls and are more likely to reduce existing controls. This confirms the prior discussed in section 3 that there is a positive relationship between trade and financial openness.

Moreover, there is little evidence that levels and changes in capital controls are systematically linked to the level of public debt or external debt. After 1999, there is some indication though that countries with a higher external debt have been less likely to lower capital controls and more likely to keep existing restrictions.

As to the event study of Figure 7, there is no indication that either inflation rates or GDP volatility decline in years after the introduction of capital controls. Again, this needs to be interpreted cautiously as one lacks the proper counterfactual of would have happened to these variables if capital controls had not been changed for these countries, but they are suggestive that a reduction in inflation and output volatility did not materialize rapidly after increases in capital controls.

4.5 Joint test of four hypotheses

As the final step of the analysis, the various hypotheses are tested jointly together in a single estimation. A key challenge of estimating all four hypotheses individually is, of course, that variables for different hypotheses may be correlated with one another, hence that tests of individual hypotheses may suffer from an omitted variable bias. On the other hand, given the large number of variables it is impossible to combine all four hypotheses in a meaningful way by including all variables simultaneously in the estimations.

As a middle way between these two, I choose to focus on those variables that have been identified as important determinants in the individual hypothesis tests above. In particular, the overvaluation and FX regime variables are included for the FX hypothesis, credit growth and inflation as proxies for overheating, and financial depth for the degree of financial market development.

Importantly, there may an additional determinant of capital controls, which has been discussed in detail in the introduction, and that is a potential externality of capital controls in that e.g. high controls or the raising of capital controls in some countries may make it more likely for other countries to follow suit and act in a similar way. Such an externality may be captured by including an additional variable ("Capital controls region") that measures the average level or average change of capital controls in the region in the previous year.

Table 12

Table 12 shows the parameter estimates for this combined test of equation (1), using OLS, for the "level" estimations and of equation (2), using a logit model, for the estimation for "changes" in capital controls. Importantly, all of the findings for the single-hypothesis tests above are confirmed when combining the different variables in a single model. The only variable that loses somewhat in significance is the financial depth variable.

Moreover, the variable of capital controls in the region to capture externalities from capital controls is highly significant and large in magnitude. For the estimation for changes, this implies that countries are more likely to raise controls as well as lower controls when other countries in the region have done so recently. In addition, the magnitude of the coefficients becomes much larger after 1999, suggesting that such externalities have become more important in the 2000s.

Overall, the evidence on the real economy and on financial stability of the previous subsection suggest that concerns about an overheating of the economy – in the form of high credit growth, rising inflation and output volatility – rather than narrow financial market concerns, are an important motive for the decisions of policy-makers to raise and maintain capital controls.

5. Conclusions

The intention of the paper has been to gauge the motives of policy-makers to use capital controls as an active policy tool. Hence, the intended contribution of the present paper is not to analyze whether capital controls are effective in achieving their objectives – as a sizeable literature has been trying to establish – but rather to understand what drives policy-makers in their decisions to use capital flow restrictions.

The findings of the paper suggest that FX policy management has been a central motive for policy-makers to use capital controls. Countries with a high level of capital controls and countries actively raising existing controls are those that tend to have undervalued exchange rates and a high degree of exchange rate volatility.

Moreover, the choice of capital flow restrictions is closely linked to countries choices about the exchange rate regime and the monetary policy regime. The findings of the paper suggest that countries with a high level of capital flow restrictions tend be those with fixed exchange rates and those with other regimes than inflation targeting (IT). Moreover, countries with fixed exchange rates and non-IT regimes have been much more likely to raise capital controls over the past decade.

The analysis of the paper finds no systematic evidence for a link between capital controls and a high volume or volatility of capital flows per se. There is also no compelling evidence that policy decisions about capital controls is related to a high degree of financial market stress or volatility. It seems that choices about capital flow restrictions, in particular over the past decade, have been rather motivated by concerns about an overheating of the domestic economy – in the form of high credit growth, inflation and output volatility.

Taken together, the evidence suggests that both an FX policy objective and concerns about domestic overheating are the key motives for capital flow management policies over the past decade. Hence capital controls have not merely been associated with preventing an overvaluation or appreciation of the domestic currency, but rather with a significant undervaluation of the exchange rate. This provides support to those who have warned against the use of policies that trigger "competitive devaluations" and "currency wars".

Moreover, the evidence indicates that capital controls may frequently be used to compensate for the absence of autonomous and independent monetary policy. Countries that have fixed exchange rate regimes and shallow financial markets have little ability to use monetary policy to deal with domestic overheating pressures. Hence even relatively modest capital inflows or volatility in flows pose a serious challenge to domestic policy-makers and may induce them to use capital flow restrictions.

Putting these pieces of evidence together make it hard to see how capital flow management policies can be a first-best solution to domestic policy challenges. It may indeed be the case that the imposition of capital controls may help to "buy time" for domestic policy makers to address underlying economic, institutional and policy weaknesses at home. Yet the risk is that these policy choices become entrenched and

reduce the urgency and incentives of policy-makers to address the true root causes of domestic vulnerabilities to fluctuations in capital flows. The persistence and frequent re-introduction of capital control measures in recent years suggest that this risk may become a reality.

References

Aizenman, Joshua, and Vladyslav Sushko. (2011). "Capital Flows: Catalyst or Hindrance to Economic Takeoffs?" NBER Working Paper 17258.

Bekaert, Geert, Michael Ehrmann, Marcel Fratzscher, and Arnaud Mehl. (2011). "Global Crises and Equity Market Contagion." NEBR Working Paper No 17121.

Broner, Fernando, R. Gaston Gelos, and Carmen Reinhart. (2006). "When in Peril, Retrench: Testing the Portfolio Channel of Contagion." *Journal of International Economics* 69(1): 203-230.

Bussiere, Matthieu, Michele Ca' Zorzi, Alexander Chudik and Alistair Dieppe (2010). "Methodological advances in the assessment of equilibrium exchange rates", ECB Working Paper No. 1151.

Calvo, Guillermo, Alejandro Izquierdo, and Luis-Fernando Mejía. (2008). "Systemic Sudden Stops: The Relevance of Balance-Sheet Effects and Financial Integration." NBER Working Paper 14026.

Calvo, Guillermo, Leonardo Leiderman, and Carmen Reinhart. (1996). "Inflows of Capital to Developing Countries in the 1990s." *Journal of Economic Perspectives* 10(2): 123-139.

Curcuru, Stephanie, Charles Thomas, Francis Warnock, and Jon Wongswan. (2011). "U.S. International Equity Investment and Past and Prospective Returns." *American Economic Review,* forthcoming.

Cardarelli, Roberto, Selim Elekdag, and M. Ayhan Kose. (2009). "Capital Inflows: Macroeconomic Implications and Policy Responses." IMF Working Paper WP/09/40.

Chamon, Marcos, Atish Ghosh, Jonathan Ostry and Mahvash Qureshi. (2011). "Managing Capital Inflows: The Role of Controls and Prudential Policies." NBER Working Paper 17363.

Chinn, Menzie and Hiro Ito. (2008). "A New Measure of Financial Openness." *Journal of Comparative Policy Analysis* 10(3): 309-22. (Update 2011 at http://web.pdx.edu/~ito/Chinn-Ito_website.htm)

Dorrucci, Ettore, Alexis Meyer-Cirkel and Daniel Santabárbara (2009). "Domestic financial development in emerging economies: evidence and implications", ECB Occasional Paper No. 102, April 2009.

Forbes, Kristin. (2007). "The Microeconomic Evidence on Capital Controls: No Free Lunch." In Sebastian Edwards, ed., *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices, and Consequences.* Chicago: University of Chicago Press, pgs. 171-202.

Forbes, Kristin, Marcel Fratzscher, Thomas Kostka and Roland Straub (2011). "Bubble Thy Neighbor: Direct and Spillover Effects of Capital Controls", mimeo November 2011.

Forbes, Kristin, and Frank Warnock (2011). Capital Flow Waves: Surges, Stops, Flight and Retrenchment NBER Working Paper No. 17351.

Fratzscher, Marcel. (2011). "Capital Flows, Global Shocks and the 2007-08 Financial Crisis." NBER Working Paper 17357.

Gelos, R. Gaston and Shang-Jin Wei. (2005). "Transparency and International Portfolio Holdings." *The Journal of Finance* 60(6, Dec): 2987-3020

Hau, Harald and Hélène Rey. (2005). "Exchange Rates, Equity Prices, and Capital Flows." *The Review of Financial Studies* 19(1): 273-317.

Henry, Peter Blair. (2007). "Capital Account Liberalization: Theory, Evidence and Speculation." *Journal of Economic Literature* 45(4, Dec): 887-935.

Jeanne, Olivier. (2011). "Who Needs to Open the Capital Account?" Mimeo. Peterson Institute of International Economics.

Korinek, Anton. (2010). "Regulating Capital Flows to Emerging Markets: An Externality View." Mimeo. University of Maryland

Magud, Nicolas, Carmen Reinhart, and Kenneth Rogoff. (2011). "Capital Controls: Myth and Reality – A Portfolio Balance Approach." Peterson Institute of International Economics. WP 11-7.

Ostry, Jonathan, Atish Ghosh, Karl Habermeier, Luc Laeven, Marcos Chamon, Mahvash Qureshi, and Annamaria Kokenyne. (2011). "Managing Capital Inflows: What Tools to Use?" IMF Staff Discussion Note SDN/11/06.

Ostry, Jonathan, Atish Ghosh, Karl Habermeier, Marcos Chamon, Mahvash Qureshi, and Dennis Reinhardt (2010). "Capital Inflows: The Role of Controls." IMF Staff Position Note 10/04.

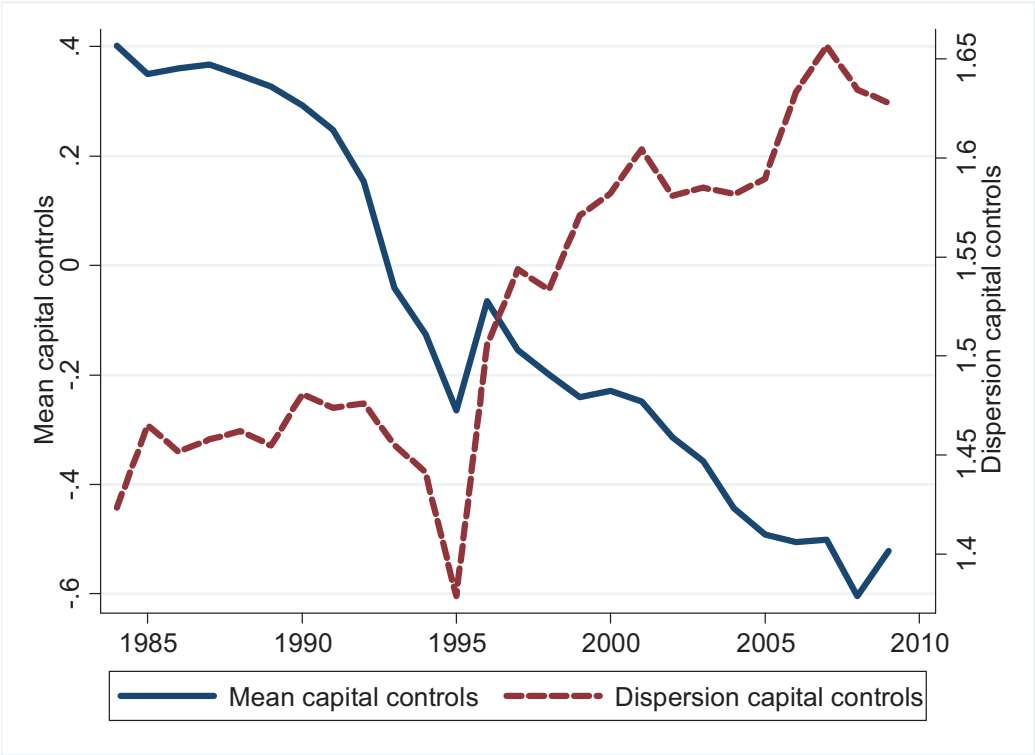
Prasad, Eswar, Kenneth Rogoff, Shang-Jin Wei, and M. Ayhan Kose (2003). "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence." International Monetary Fund Occasional Paper #220.

Raddatz, Claudio and Sergio Schmukler (2011). "On the International Transmission of Shocks: Micro-Evidence from Mutual Fund Portfolios." NBER Working Paper 17358.

Rajan, Raghu (2010). "Beggaring the World Economy." Project Syndicate. http://www.project-syndicate.org/commentary/rajan10/English

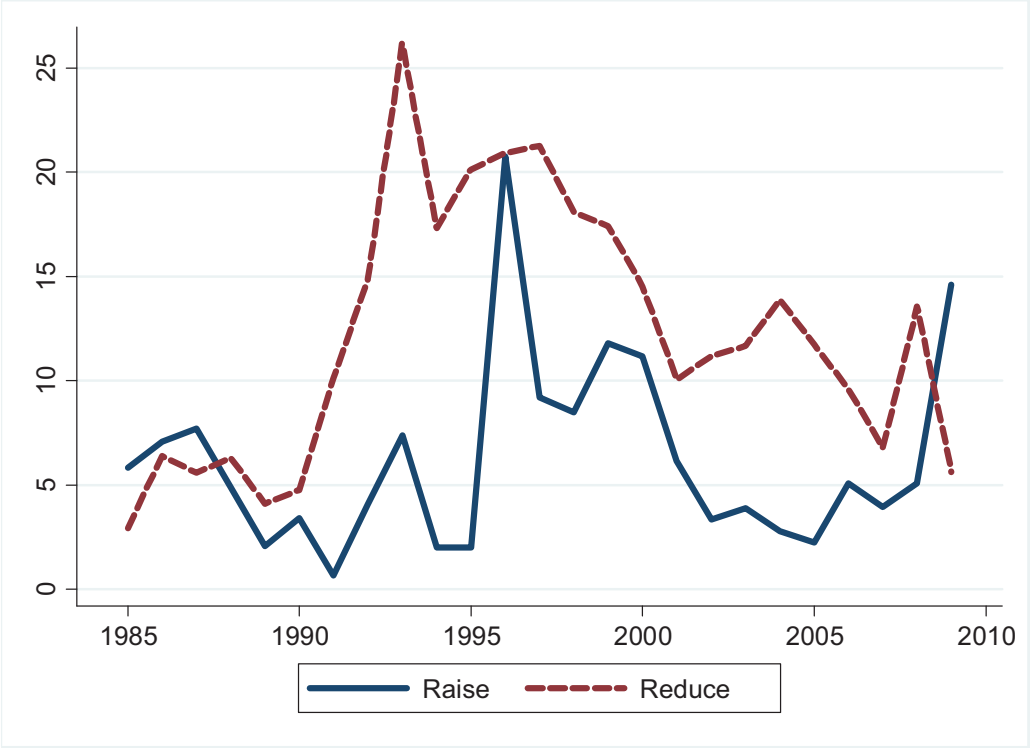
Schindler, Martin (2009). "Measuring Financial Integration: A New Dataset," *IMF Staff Papers* 56:1, 222-238.

Figure 1: The evolution of capital controls since the 1980s



Notes: The chart shows the evolution of (normalized) capital controls, using the measure of Chinn and Ito (2011), for the average across all 79 countries of the sample, as well as providing the dispersion – the standard deviation across countries for each year – since 1984.

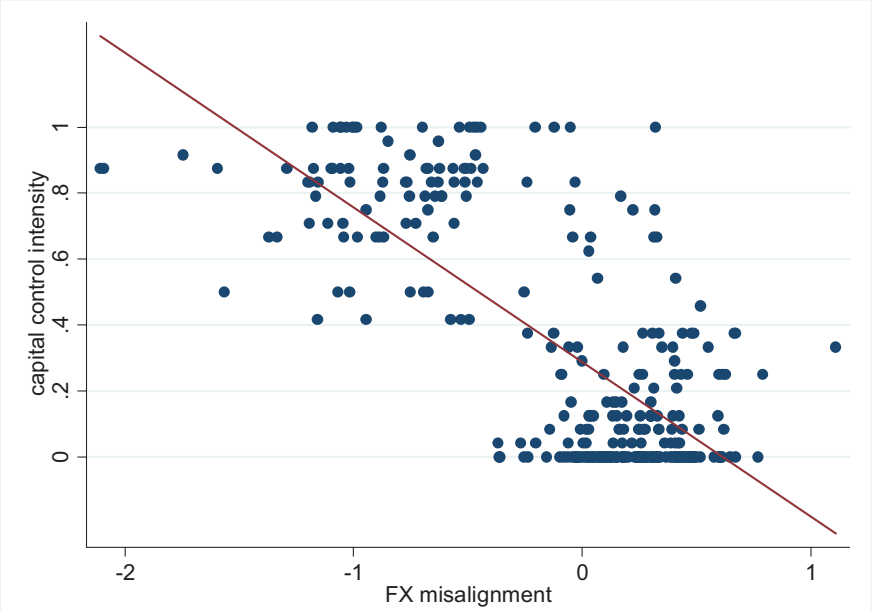
Figure 2: The evolution of *changes* in capital controls since the 1980s



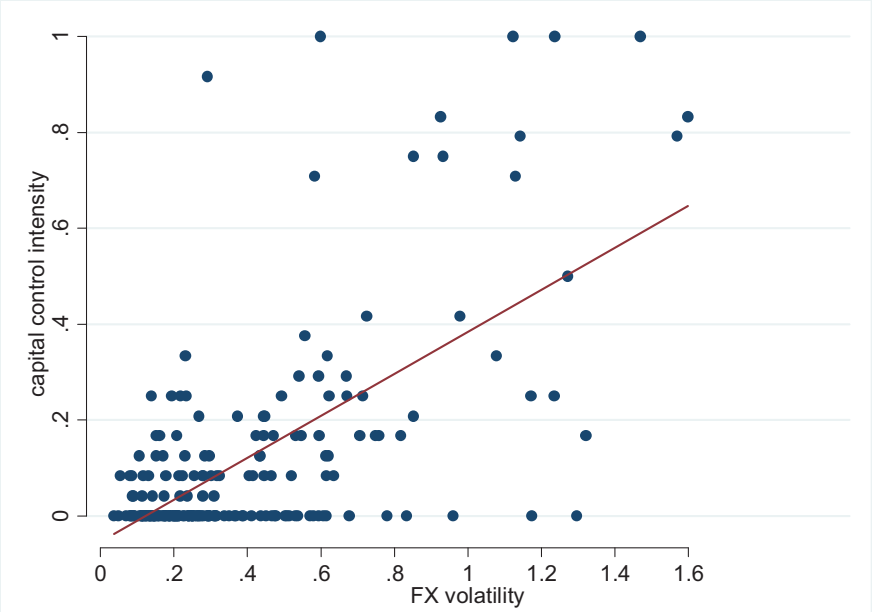
Notes: The chart shows the evolution of the *changes* in (normalized) capital controls, using the measure of Chinn and Ito (2011). Specifically, the figure shows the share of countries raising capital controls, lowering them or keeping them constant, as a share of all 79 countries of the sample for each year since 1984.

Figure 3: Capital controls and exchange rate policy

A. FX overvaluation

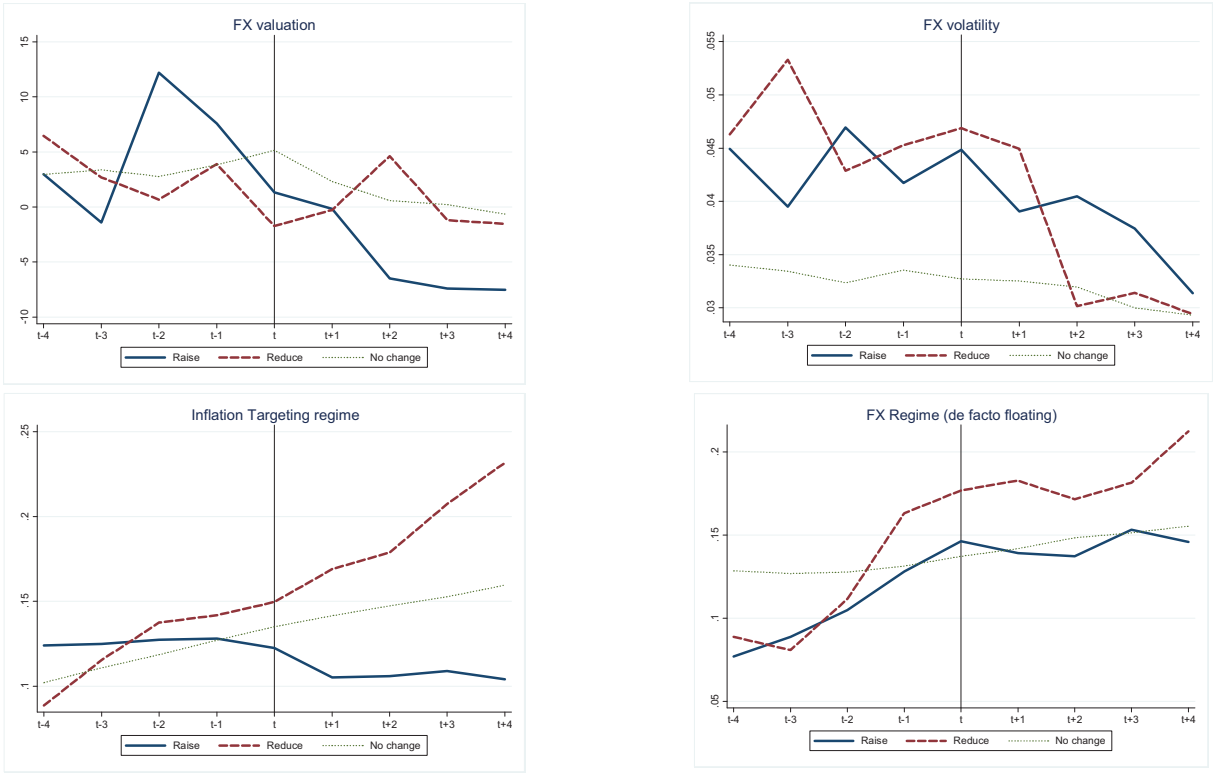


B. FX volatility



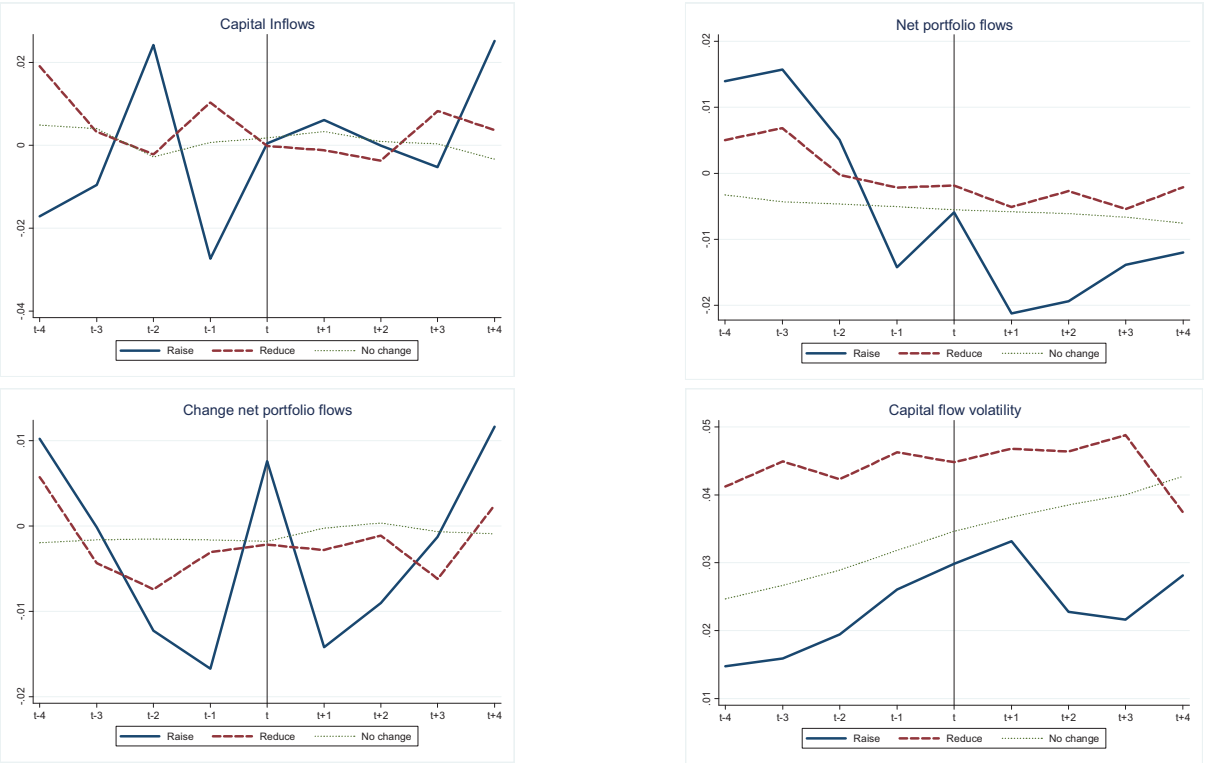
Notes: The figure shows the values of the capital control measure against the values for FX overvaluation (panel A) and FX volatility (panel B) for all countries and each of the years 2003-2007, i.e. during the pre-crisis period.

Figure 4: FX policy – Evolution around changes in capital controls



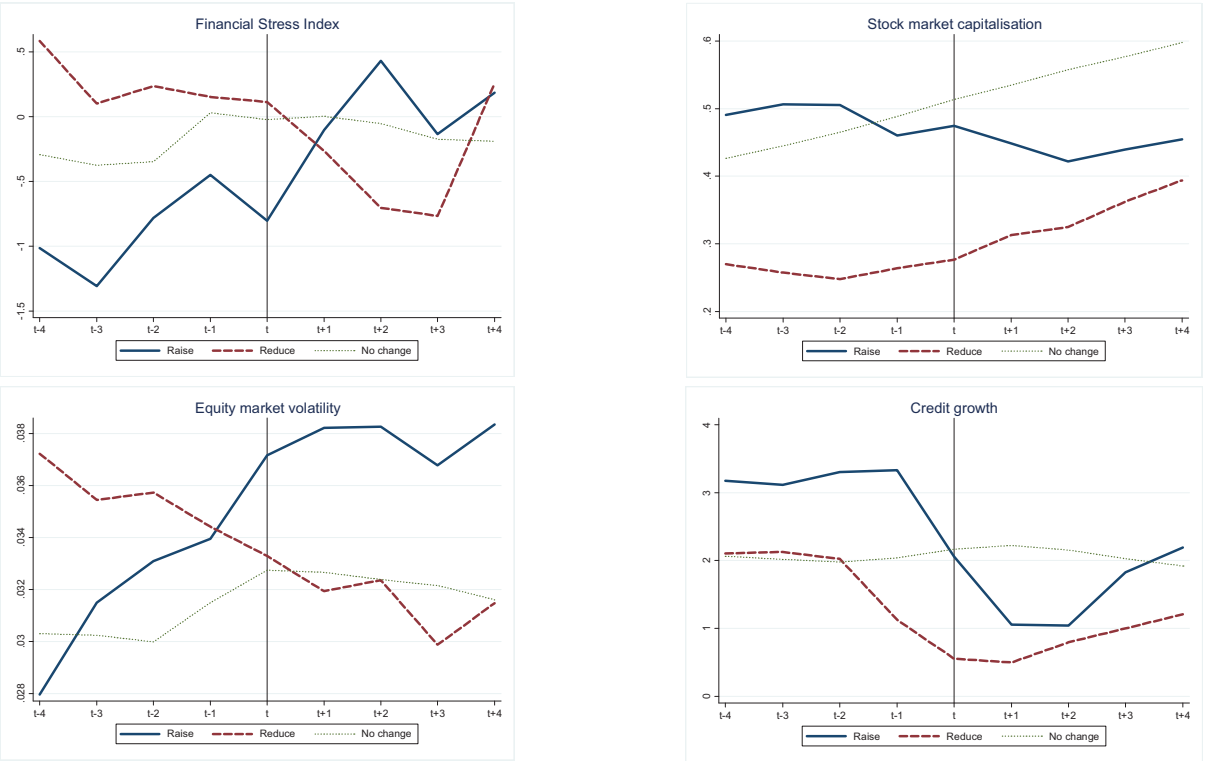
Notes: The figures show the evolution of variables around changes (either increases or reductions) in capital controls, compared to countries with no changes. The horizontal axis indicates the four years prior and four years subsequent to these changes.

Figure 5: Capital flows – Evolution around changes in capital controls



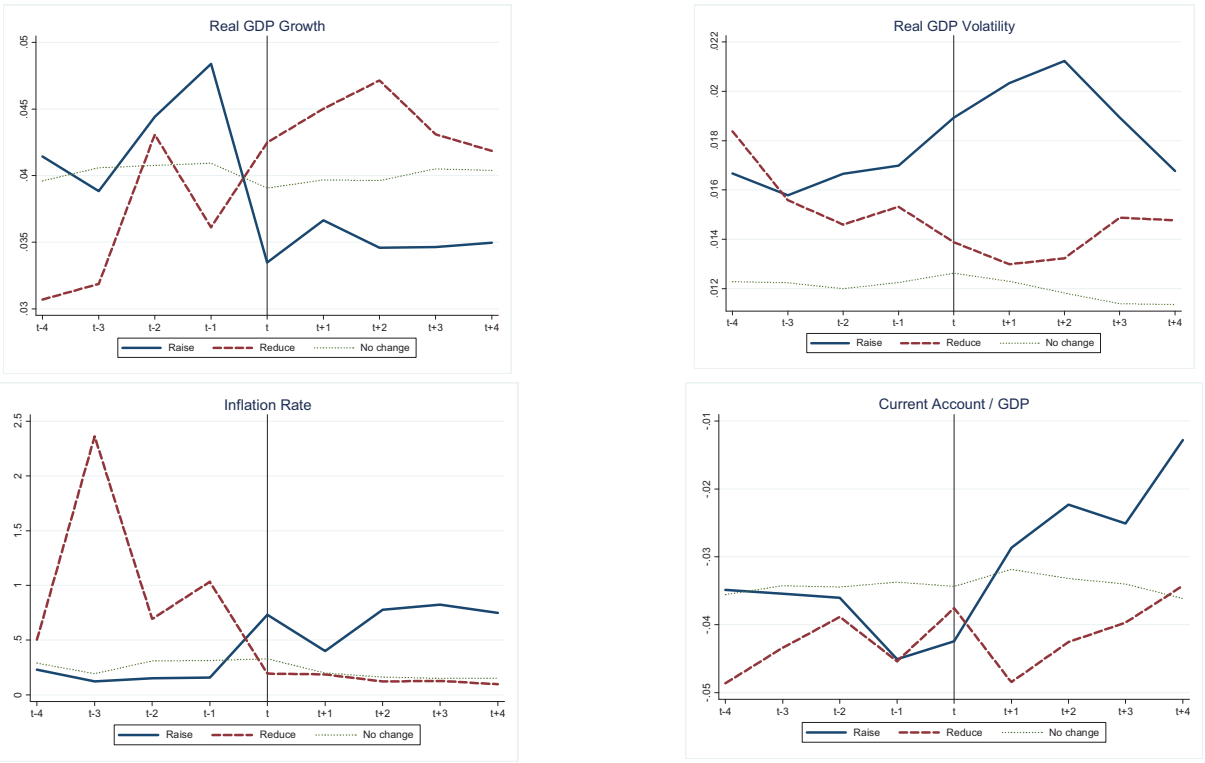
Notes: The figures show the evolution of variables around changes (either increases or reductions) in capital controls, compared to countries with no changes. The horizontal axis indicates the four years prior and four years subsequent to these changes.

Figure 6: Financial stability – Evolution around changes in capital controls



Notes: The figures show the evolution of variables around changes (either increases or reductions) in capital controls, compared to countries with no changes. The horizontal axis indicates the four years prior and four years subsequent to these changes.

Figure 7: Real economy and external objectives – Evolution around changes in capital controls



Notes: The figures show the evolution of variables around changes (either increases or reductions) in capital controls, compared to countries with no changes. The horizontal axis indicates the four years prior and four years subsequent to these changes.

Table 1: Country sample

Advanced		Emerging				Developing	
Australia	Italy	Algeria	Ecuador	Morocco	Slovenia	Armenia	Malawi
Belgium	Japan	Argentina	Hungary	Pakistan	South Africa	Burundi	Moldova
Canada	New Zealand	Bolivia	India	Paraguay	Thailand	Congo, DR	Nicaragua
Denmark	Norway	Brazil	Indonesia	Peru	Tunisia	Costa Rica	Nigeria
Finland	Portugal	Chile	Israel	Philippines	Turkey	Dominican Repu	Papua New Guinea
France	Spain	China	Korea	Poland	Ukraine	Fiji	Samoa
Germany	Sweden	Colombia	Latvia	Romania	Uruguay	Gambia	Sierra Leone
Greece	Switzerland	Croatia	Malaysia	Russian Fe	Venezuela, RB	Ghana	Solomon Islands
Iceland	United Kingdom	Cyprus	Malta	Singapore		Guyana	Trinidad and Tobago
Ireland	United States	Czech Rep	Mexico	Slovak Republic		Iran	Uganda
							Zambia

Table 2: Data description and sources

Variable	Description	Source
FX policy		
FX overvaluation	FX overvaluation based on behavioural (BEER) and fundamental (FEER) equilibrium exchange rate models for REER	Bussiere et al. (2010)
Trend appreciation	Appreciation of the REER over past year	BIS, IMF
Interest rate differential	Three-month money market interest rate differential vis-à-vis anchor currency country (US or euro area)	BIS, IMF
FX volatility	Standard deviation of monthly REER changes	BIS, IMF
FX reserves - level	FX reserves to GDP ratio	IMF
FX regime -- float	dummy - value of one if a currency is classified as freely floating, zero otherwise	IMF classification
IT regime	dummy - value of one if the country is using an IT strategy (including "IT light"), zero otherwise	IMF, Stone et al., ECB
Capital flows		
Capital outflows	Gross outflows of portfolio investment and other investment as a share of GDP	IMF
Capital inflows	Gross inflows of portfolio investment and other investment as a share of GDP	IMF
Net portfolio flows	Net portfolio investment flows as a share of GDP	IMF
Change capital outflows	Change in gross outflows relative to last year	IMF
Change capital inflows	Change in gross inflows relative to last year	IMF
Change net portfolio flows	Change in net portfolio flows relative to last year	IMF
Capital flow volatility	Standard deviation of monthly net portfolio flows to GDP	IMF
Financial stability		
Financial depth	Institutional index of financial development (inverted): higher value = less financial depth	Dorrucci et al. (2009)
Financial Stress Index	Composite of returns and volatility in equity, bond and money markets	IMF
Stock market capitalisation	Stock market capitalisation to GDP ratio	Datastream
Equity market returns	Change in equity return index	Datastream
Equity return volatility	Standard deviation of monthly equity returns	Datastream
Credit growth	Change in credit flows to the private sector, relative to GDP	IMF
Equity valuation	Deviation of annual equity returns from trend	Datastream
Real economy and external stability		
GDP growth	Annual GDP growth rate	IMF
GDP growth volatility	Standard deviation of monthly net portfolio flows to GDP during the previous year	IMF
Inflation rate	CPI inflation rate	IMF
Current account / GDP	Current account to GDP ratio	IMF
Trade openness	Exports plus import to GDP ratio	IMF
Public Debt / GDP	Public debt to GDDP ratio	GDI
External debt / GDP	External debt to GDP ratio	GDI

Table 3: Summary statistics

	Mean	Std. Dev.	Min	Max
FX policy				
FX overvaluation	7.175	17.663	-21.649	45.700
Trend appreciation	-0.005	0.127	-19.922	26.606
Interest rate differential	7.530	18.671	-7.810	69.150
FX volatility	0.034	0.064	0	1.735
FX reserves - level	0.136	0.154	0.036	1.583
FX regime -- float	0.143	0.350	0	1
IT regime	0.133	0.340	0	1
Capital flows				
Capital outflows	-0.001	0.275	-0.402	0.853
Capital inflows	0.001	0.189	-0.544	0.505
Net portfolio flows	0.004	0.067	-0.737	0.750
Change capital outflows	-0.007	0.339	-0.284	0.190
Change capital inflows	0.003	0.218	-0.298	0.233
Change net portfolio flows	-0.001	0.068	-0.402	0.382
Capital flow volatility	0.036	0.087	0.000	0.853
Financial stability				
Financial depth	0.428	0.627	0.000	8.125
Financial Stress Index	-0.069	2.707	-5.619	15.150
Stock market capitalisation	0.473	0.602	0.000	2.425
Equity market returns	0.007	0.043	-0.169	0.773
Equity return volatility	0.033	0.034	0.000	1.094
Credit growth	1.971	23.057	0.003	52.104
Equity valuation	7.175	17.663	-21.649	45.700
Real economy and external stability				
GDP growth	0.040	0.027	-0.151	0.177
GDP growth volatility	0.013	0.012	0.001	0.113
Inflation rate	8.331	5.394	-2.176	267.067
Current account / GDP	-0.004	0.051	-0.224	0.238
Trade openness	0.816	0.473	0.003	4.729
Public Debt / GDP	0.584	0.392	0.050	2.898
External debt / GDP	0.177	0.282	0.003	0.734

Table 4: FX policy (Hypothesis 1)

A. Level of capital controls

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	-0.137	-0.600		-0.828**	–
	(0.271)	(0.459)		(0.372)	
Trend appreciation	-0.213***	-0.143	-0.225***		–
	(0.0758)	(0.147)	(0.0704)		
Interest rate differential	0.645***	0.406**	0.657***	0.161***	+
	(0.139)	(0.183)	(0.135)	(0.0314)	
FX volatility	0.424**	0.941***	0.430**	1.026***	+
	(0.181)	(0.243)	(0.180)	(0.219)	
FX reserves - level	-0.0172	0.148		0.143	+
	(0.0564)	(0.0974)		(0.0950)	
FX regime -- float	-1.061***	-0.790***	-1.027***	-0.778***	–
	(0.139)	(0.192)	(0.116)	(0.156)	
IT regime	0.0677	-0.0219			–
	(0.155)	(0.193)			
Observations	778	397	778	397	
Countries	79	79	79	79	
R-squared	0.194	0.149	0.397	0.343	

B. Changes in capital controls

	Combined model				Encompassing model				*Hypothesis*	
	benchmark		*post 1999*		*benchmark*		*post 1999*			
	reduce	raise	reduce	raise	reduce	raise	reduce	raise	reduce	raise
FX overvaluation	0.780	-0.312	1.315	-0.673				-0.613*	+	–
	(0.767)	(0.442)	(1.594)	(0.437)				(0.369)		
Trend appreciation	-0.0835	0.494**	0.852*	0.127		0.444**	0.841*		+	–
	(0.151)	(0.227)	(0.510)	(0.374)		(0.213)	(0.478)			
Interest rate different	0.253	0.000671	-0.146	0.0218	0.633***				–	+
	(0.182)	(0.204)	(0.292)	(0.270)	(0.0367)					
FX FX volatility	0.552*	0.584	1.688***	1.424***		0.610	1.471***	1.375***	–	+
	(0.283)	(0.402)	(0.474)	(0.538)		(0.373)	(0.442)	(0.437)		
FX reserves - level	0.112	0.115	0.398*	0.112			0.450**		–	+
	(0.121)	(0.112)	(0.206)	(0.155)			(0.196)			
FX regime -- float	-0.650	0.0739	-1.149*	-0.0706			-0.982*		+	–
	(0.407)	(0.385)	(0.603)	(0.611)			(0.553)			
IT regime	0.755**	-0.391	1.622***	-0.0108			1.623***		+	–
	(0.345)	(0.436)	(0.543)	(0.662)			(0.543)			
Observations	778	772	397	397	778	772	397	397		
Countries	79	79	79	79	79	79	79	79		
R-squared	0.194	0.066	0.149	0.051	0.397	0.079	0.343	0.048		

Notes: The table shows the parameter estimates of equation (1), using OLS, in panel A and of equation (2), using a logit model, in panel B. The columns "Hypothesis" provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 5: Economic relevance of alternative hypotheses

	Hypothesis	*Interdecile*
FX policy		
FX overvaluation	–	-2.55
Trend appreciation	–	-0.27
Interest rate differential	+	0.14
FX volatility	+	1.73
FX reserves - level	+	0.21
FX regime -- float	–	-0.77
IT regime	–	
Capital flows		
Capital outflows	+	-0.33
Capital inflows	+	-0.21
Net portfolio flows	+	0.19
Change capital outflows	+	-0.09
Change capital inflows	+	
Change net portfolio flows	+	-0.24
Capital flow volatility	+	0.13
Financial stability		
Financial depth	–	-0.59
Financial Stress Index	+ / ?	-0.34
Stock market capitalisation	–	-1.10
Equity market returns	–	
Equity return volatility	+	0.21
Credit growth	+ / ?	1.66
Equity valuation	–	-0.55
Real economy		
GDP growth	–	0.32
GDP growth volatility	+	0.34
Inflation rate	+	0.84
Current account / GDP	–	-0.20
Trade openness	– / ?	-0.29
Public Debt / GDP	+	
External debt / GDP	+	-0.14

Notes: The column labeled "interdecile" shows the difference in the level of capital controls for a country with the respective factor at its 90th percentile compared to a country with the same factor at the 10th percentile.

Table 6: FX policy (Hypothesis 1) – Robustness
Alternative proxy of capital controls (Schindler)

Level of capital controls

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	-0.0800	-0.461***		-0.388**	–
	(0.112)	(0.174)		(0.156)	
Trend appreciation	-0.0377	0.0269	-0.0444*		–
	(0.0293)	(0.0468)	(0.0258)		
Interest rate differential	0.0829***	0.0359	0.0895***	0.0418	+
	(0.0302)	(0.0362)	(0.0267)	(0.0308)	
FX volatility	0.111*	0.127*	0.112**	0.122*	+
	(0.0571)	(0.0731)	(0.0567)	(0.0727)	
FX reserves - level	0.0371*	0.0595**	0.0366*	0.0603**	+
	(0.0208)	(0.0299)	(0.0208)	(0.0299)	
FX regime -- float	-0.142***	-0.0752	-0.138***	-0.106**	–
	(0.0508)	(0.0675)	(0.0386)	(0.0506)	
IT regime	0.00766	-0.0532			–
	(0.0498)	(0.0644)			
Observations	352	220	352	220	
Countries	79	79	79	79	
R-squared	0.120	0.122	0.481	0.486	

Notes: The table shows the parameter estimates of equation (1), using OLS – the capital control measure used here is the one by Schindler (2009). The columns "Hypothesis" provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 7: FX policy (Hypothesis 1) – Robustness
Controls on inflows versus outflows (alternative proxy of capital controls of Schindler)

A. Level of capital controls on inflows

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	-0.0664	-0.318**		-0.320**	–
	(0.0871)	(0.149)		(0.129)	
Trend appreciation	-0.0234	0.0179	-0.0285		–
	(0.0243)	(0.0407)	(0.0220)		
Interest rate differential	0.0574**	0.0169	0.0618***		+
	(0.0251)	(0.0286)	(0.0217)		
FX volatility	0.0748	0.0978	0.0746	0.104*	+
	(0.0489)	(0.0668)	(0.0487)	(0.0577)	
FX reserves - level	0.0142	0.0283			+
	(0.0181)	(0.0269)			
FX regime -- float	-0.138***	-0.104*	-0.116***	-0.109***	–
	(0.0427)	(0.0596)	(0.0329)	(0.0408)	
IT regime	0.0464	0.0153			–
	(0.0421)	(0.0578)			
Observations	352	220	352	220	
Countries	79	79	79	79	
R-squared	0.090	0.081	0.447	0.448	

B. Level of capital controls on outflows

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	-0.0935	-0.603***		-0.562***	–
	(0.147)	(0.213)		(0.187)	
Trend appreciation	-0.0519	0.0359	-0.0602*		–
	(0.0359)	(0.0578)	(0.0312)		
Interest rate differential	0.108***	0.0550	0.115***	0.0722*	+
	(0.0371)	(0.0470)	(0.0330)	(0.0392)	
FX volatility	0.146**	0.157*	0.150**	0.125	+
	(0.0706)	(0.0901)	(0.0697)	(0.0872)	
FX reserves - level	0.0599**	0.0906***	0.0607**	0.0926***	+
	(0.0242)	(0.0333)	(0.0245)	(0.0332)	
FX reserves - change					–
FX regime -- float	-0.147**	-0.0465	-0.164***		–
	(0.0624)	(0.0798)	(0.0468)		
IT regime	-0.0310	-0.122		-0.142**	–
	(0.0613)	(0.0751)		(0.0568)	
Observations	352	220	352	220	
Countries	79	79	79	79	
R-squared	0.138	0.155	0.477	0.491	

Notes: The table shows the parameter estimates of equation (1), using OLS – the capital control measures used here are the total inflow controls (panel A) and the total outflow controls (panel B) of Schindler (2009). The columns "Hypothesis" provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 8: FX policy (Hypothesis 1) – Robustness
Alternative country samples

A. Level of capital controls – EMEs only

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	-0.279	-0.926		-0.799*	–
	(0.310)	(0.648)		(0.447)	
Trend appreciation	-0.168	-0.300	-0.163	-0.302**	–
	(0.142)	(0.187)	(0.103)	(0.140)	
Interest rate differential	-0.0392	-0.0884	-0.0656***		+
	(0.121)	(0.181)	(0.0220)		
FX volatility	0.197	0.0624	0.260		+
	(0.206)	(0.299)	(0.164)		
FX reserves - level	-0.491***	-0.323***	-0.493***	-0.304***	+
	(0.0533)	(0.0897)	(0.0481)	(0.0774)	
FX regime -- float	-0.581**	-0.497**	-0.570***	-0.433**	–
	(0.242)	(0.250)	(0.192)	(0.183)	
IT regime	-0.0707	-0.130			–
	(0.194)	(0.223)			
Observations	347	212	347	212	
Countries	38	38	38	38	
R-squared	0.265	0.162	0.255	0.160	

B. Level of capital controls – no LDCs

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
FX overvaluation	0.161	-0.163			–
	(0.276)	(0.459)			
Trend appreciation	-0.204*	-0.265*	-0.188*	-0.261*	–
	(0.105)	(0.160)	(0.0968)	(0.144)	
Interest rate differential	0.703***	0.365**	0.703***	0.174***	+
	(0.162)	(0.171)	(0.159)	(0.0350)	
FX volatility	0.695***	1.225***	0.687***	1.243***	+
	(0.179)	(0.282)	(0.179)	(0.264)	
FX reserves - level	-0.0358	0.113			+
	(0.0499)	(0.0843)			
FX regime -- float	-1.306***	-1.107***	-1.289***	-1.177***	–
	(0.133)	(0.192)	(0.129)	(0.183)	
IT regime	0.490***	0.463**	0.487***	0.542***	–
	(0.153)	(0.205)	(0.152)	(0.182)	
Observations	706	348	706	348	
Countries	58	58	58	58	
R-squared	0.246	0.189	0.470	0.417	

Notes: The table shows the parameter estimates of equation (1), using OLS. Panel A provides the estimates when restricting the sample to only EMEs, while Panel B gives the estimates when excluding developing countries (LDCs).

Table 9: Capital flows (Hypothesis 2)

A. Level of capital controls

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
Capital outflows	0.795***	0.756***	-0.735***	-0.562***	+
	(0.160)	(0.163)	(0.145)	(0.120)	
Capital inflows	-0.261*	-0.273*	-0.192	-0.252**	+
	(0.146)	(0.146)	(0.123)	(0.113)	
Net portfolio flows	0.211***	0.198***	0.221***	0.159***	+
	(0.0615)	(0.0617)	(0.0605)	(0.0482)	
Change capital outflows	-0.426	-0.325	-0.262		+
	(0.272)	(0.284)	(0.200)		
Change capital inflows	0.161	0.0986			+
	(0.184)	(0.192)			
Change net portfolio flows	-0.185**	-0.205**	-0.208**	-0.200***	+
	(0.0871)	(0.0824)	(0.0814)	(0.0714)	
Capital flow volatility	0.142	0.119	0.144		+
	(0.0941)	(0.0988)	(0.0932)		
Observations	743	463	743	463	
Countries	79	79	79	79	
R-squared	0.0302	0.0415	0.401	0.381	

B. Changes in capital controls

	Combined model				Encompassing model				*Hypothesis*	
	benchmark		*post 1999*		*benchmark*		*post 1999*			
	reduce	raise	reduce	raise	reduce	raise	reduce	raise	reduce	raise
Capital outflows	0.535	-0.524	0.527	-0.447					–	+
	(0.458)	(0.539)	(0.527)	(0.605)						
Capital inflows	-0.452	-0.798*	-0.456	-0.849		-0.623**		-1.145***	–	+
	(0.382)	(0.448)	(0.424)	(0.517)		(0.274)		(0.441)		
Net portfolio flows	-0.182	-0.368	-0.307	-0.839			-0.219	-1.202***	–	+
	(0.211)	(0.282)	(0.254)	(0.516)			(0.159)	(0.408)		
Change capital outflows	-0.0676	1.694	0.0974	0.734					–	+
	(0.775)	(1.104)	(0.872)	(1.301)						
Change capital inflows	0.447	-0.387	0.283	-0.0635					–	+
	(0.428)	(0.751)	(0.462)	(0.766)						
Change net portfolio flows	0.0933	-0.368*	0.117	-0.299		-0.479***			–	+
	(0.122)	(0.219)	(0.125)	(0.242)		(0.158)				
Capital flow volatility	0.162	-2.194***	0.0742	-2.675***	0.201	-1.700***		-2.447***	–	+
	(0.157)	(0.697)	(0.162)	(1.012)	(0.125)	(0.626)		(0.819)		
Observations	743	739	463	463	743	739	463	463		
Countries	79	79	79	79	79	79	79	79		

Notes: The table shows the parameter estimates of equation (1), using OLS, in panel A and of equation (2), using a logit model, in panel B. The columns “Hypothesis” provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 10: Financial stability (Hypothesis 3)

A. Level of capital controls

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
Financial depth	-0.308**	-0.361***	-0.261**	-0.367***	–
	(0.130)	(0.133)	(0.125)	(0.132)	
Financial Stress Index	-0.0844	-0.159*		-0.156*	+ / ?
	(0.0678)	(0.0844)		(0.0838)	
Stock market capitalisation	-0.502***	-0.578***	-0.443***	-0.579***	–
	(0.146)	(0.152)	(0.138)	(0.152)	
Equity market returns	0.00644	0.0589			–
	(0.0807)	(0.112)			
Equity return volatility	1.828***	1.743***	1.794***	1.809***	+
	(0.174)	(0.254)	(0.138)	(0.204)	
Credit growth	28.69***	30.96***	22.16***	31.01***	+ / ?
	(4.199)	(5.041)	(1.906)	(5.048)	
Equity valuation	-0.182*	-0.261**	-0.171*	-0.256**	–
	(0.0978)	(0.114)	(0.0945)	(0.116)	
Observations	511	344	511	344	
Countries	79	79	79	79	
R-squared	0.323	0.295	0.689	0.612	

B. Changes in capital controls

	Combined model				Encompassing model				*Hypothesis*	
	benchmark		*post 1999*		*benchmark*		*post 1999*			
	reduce	raise	reduce	raise	reduce	raise	reduce	raise	reduce	raise
Financial depth	0.921	0.137	0.585	-0.0396	1.348***		0.854		–	+
	(0.816)	(0.424)	(0.984)	(0.759)	(0.494)		(0.535)			
Financial Stress Index	0.00156	-0.633*	0.112	-1.483**		-0.424*		-1.211***	– / ?	+ / ?
	(0.249)	(0.324)	(0.392)	(0.597)		(0.250)		(0.432)		
Stock market capitalisation	-0.231	0.253	-0.349	-0.985**				-0.502**	+	–
	(0.557)	(0.379)	(0.590)	(0.440)				(0.243)		
Equity market returns	-0.0747	-0.354	-0.489	-0.833*				-0.684*	+	–
	(0.259)	(0.334)	(0.368)	(0.501)				(0.401)		
Equity return volatility	1.140*	-0.225	2.458**	1.216	1.031*		1.776**	1.091	–	+
	(0.657)	(0.624)	(1.064)	(0.834)	(0.537)		(0.849)	(0.779)		
Credit growth	31.95	57.11***	54.89**	85.11***		37.58***		50.58***	– / ?	+ / ?
	(20.45)	(11.80)	(26.02)	(23.18)		(3.410)		(9.574)		
Equity valuation	0.155	0.585	-0.0510	0.164		0.613**			+	–
	(0.352)	(0.447)	(0.397)	(0.525)		(0.258)				
Observations	511	511	344	344	511	511	344	344		
Countries	79	79	79	79	79	79	79	79		

Notes: The table shows the parameter estimates of equation (1), using OLS, in panel A and of equation (2), using a logit model, in panel B. The columns “Hypothesis” provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 11: Real economy and external stability (Hypothesis 4)

A. Level of capital controls

	Combined model		Encompassing model		*Hypothesis*
	benchmark level	*post 1999* level	*benchmark* level	*post 1999* level	
GDP growth	0.724***	1.002***	0.735***	1.020***	–
	(0.183)	(0.206)	(0.167)	(0.198)	
GDP growth volatility	0.256**	0.166	0.210*		+
	(0.120)	(0.151)	(0.111)		
Inflation rate	13.01**	36.84***	22.85***	41.99***	+
	(5.262)	(9.156)	(1.682)	(8.109)	
Current account / GDP	-0.299***	-0.163	-0.304***	-0.165	–
	(0.111)	(0.109)	(0.110)	(0.109)	
Trade openness	-0.294***	-0.329***	-0.285***	-0.314***	– / ?
	(0.0904)	(0.0936)	(0.0873)	(0.0931)	
Public Debt / GDP	-0.0368	0.0218			+
	(0.103)	(0.111)			
External debt / GDP	-0.0974	-0.0515	-0.0913		+
	(0.0703)	(0.0716)	(0.0640)		
Observations	352	273	352	273	
Countries	79	79	79	79	
R-squared	0.102	0.162	0.554	0.579	

B. Changes in capital controls

	Combined model				Encompassing model				*Hypothesis*	
	benchmark		*post 1999*		*benchmark*		*post 1999*			
	reduce	raise	reduce	raise	reduce	raise	reduce	raise	reduce	raise
GDP growth	-2.172***	1.515***	-2.039***	0.895	-2.114***	1.256**	-1.987***		+	–
	(0.664)	(0.563)	(0.690)	(0.601)	(0.642)	(0.576)	(0.592)			
GDP growth volatility	-0.559	0.426	-0.312	0.523	-0.512	0.511*		0.661**	–	+
	(0.386)	(0.309)	(0.340)	(0.426)	(0.365)	(0.285)		(0.322)		
Inflation rate	22.84	43.75***	65.40*	57.72	18.93	57.06***	60.79***	50.58***	–	+
	(14.08)	(12.90)	(35.77)	(47.08)	(12.69)	(7.723)	(9.091)	(7.762)		
Current account / GDP	-0.130	-0.130	0.289	0.123					+	–
	(0.765)	(0.609)	(0.791)	(0.663)						
Trade openness	1.238***	-0.0497	1.156**	0.427	1.201***		1.024**		+ / ?	– / ?
	(0.458)	(0.571)	(0.555)	(0.717)	(0.392)		(0.409)			
Public Debt / GDP	0.614**	-0.655	0.399	-0.258	0.572**				–	+
	(0.270)	(0.484)	(0.433)	(0.564)	(0.270)					
External debt / GDP	-1.578**	0.110	-2.467***	0.121	-1.706**		-2.217***		–	+
	(0.774)	(0.215)	(0.875)	(0.199)	(0.727)		(0.841)			
Observations	352	352	273	273	352	352	273	273		
Countries	79	79	79	79	79	79	79	79		

Notes: The table shows the parameter estimates of equation (1), using OLS, in panel A and of equation (2), using a logit model, in panel B. The columns “Hypothesis” provide the priors for the signs of the respective coefficients. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Table 12: Combining all four hypotheses, plus capital control spillovers

	Level			Change					
	benchmark	*post 1999*	*Hypothesis*	*benchmark*		*post 1999*		*Hypothesis*	
				reduce	raise	reduce	raise	reduce	raise
FX overvaluation	-0.1786**	-0.3949*	–	0.6790*	-0.6615**	0.5123	-1.8916**	+	–
	(0.087)	(0.229)		(0.411)	(0.362)	(0.915)	(0.942)		
FX regime -- float	-0.4470***	-0.3456**	–	0.6876*	-0.5668	1.2647***	0.8147	+	–
	(0.112)	(0.150)		(0.357)	(0.436)	(0.439)	(0.817)		
Credit growth	4.1435**	10.7229***	+	0.2111	16.1114**	12.5636	24.1313*	–	+
	(1.879)	(2.114)		(9.455)	(7.419)	(9.264)	(13.758)		
Inflation rate	11.6542***	14.2840***	+	4.8129	12.0152***	9.2813	37.1220**	–	+
	(2.652)	(4.509)		(2.879)	(4.044)	(11.423)	(14.850)		
Financial depth	-0.1200**	0.0026	–	-0.6074**	0.2094	-0.3429	0.0898	+	–
	(0.053)	(0.068)		(0.265)	(0.165)	(0.275)	(0.340)		
Capital controls region	0.7775***	0.6917***	+	-2.5927**	4.1658**	-39.2038***	4.4248**	–	+
	(0.051)	(0.070)		(1.039)	(1.816)	(13.698)	(1.867)		
Observations	778	397		778	778	397	397		
Countries	79	79		79	79	79	79		
R-squared	0.45	0.33		0.35	0.37	0.38	0.39		

Notes: The table shows the parameter estimates of equation (1), using OLS, for the "level" estimations and of equation (2), using a logit model, for the estimation for "changes" in capital controls. The columns "Hypothesis" provide the priors for the signs of the respective coefficients. "Capital controls region" provides the average level or average change of capital controls in the region for the level and change estimations, respectively. ***, **, * indicate significance at the 99%, 95%, 90% levels, respectively.

Documentos de Trabajo
Banco Central de Chile

Working Papers
Central Bank of Chile

NÚMEROS ANTERIORES

PAST ISSUES

La serie de Documentos de Trabajo en versión PDF puede obtenerse gratis en la dirección electrónica: www.bcentral.cl/esp/estpub/estudios/dtbc. Existe la posibilidad de solicitar una copia impresa con un costo de $500 si es dentro de Chile y US$12 si es para fuera de Chile. Las solicitudes se pueden hacer por fax: (56-2) 6702231 o a través de correo electrónico: bcch@bcentral.cl.

Working Papers in PDF format can be downloaded free of charge from: www.bcentral.cl/eng/stdpub/studies/workingpaper. Printed versions can be ordered individually for US$12 per copy (for orders inside Chile the charge is Ch$500.) Orders can be placed by fax: (56-2) 6702231 or e-mail: bcch@bcentral.cl.

DTBC – 651 Diciembre 2011
Policy Implications of Using Audits to Detect Bank Insolvencies
Jaime Huturbia y Claudio Sardoni

DTBC – 650 Diciembre 2011
Self – Employment, Labor Market Rigidities and Unemployment Over the Business Cycle
Gonzalo Castex y Miguel Ricaurte

DTBC – 649 Diciembre 2011
The Risk of Civil Conflicts as a Determinant of Political Institutions
Álvaro Aguirre

DTBC – 648 Diciembre 2011
Propagation of Shocks to Food and Energy prices: an International Comparison
Michael Pedersen

DTBC – 647 Noviembre 2011
Incertidumbre Global Sobre la Economía Chile
Yan Carrière–Swallow y Carlos Medel

DTBC – 646 Noviembre 2011
The Impact of Uncertainty Shocks in Emerging Economies
Yan Carrière–Swallow y Luis Felipe Céspedes

DTBC – 645 Septiembre 2011
Crédito, Exceso de Toma de Riesgo, Costo de Crédito y Ciclo Económico en Chile
Carlos J. García y Andrés Sagner

DTBC – 644 Septiembre 2011
Optimal Fiscal Policy in a Small Open Economy with Limited Commitment
Sofia Bauducco y Francesco Caprioli

DTBC – 643 Septiembre 2011
Contracting Institutions and Economic Growth
Álvaro Aguirre

DTBC – 642 Agosto 2011
Dinámica de Precios en Chile: Evidencia con datos de Supermercados
Gastón Chaumont, Miguel Fuentes, Felipe Labbé y Alberto Naudon

DTBC – 641 Agosto 2011
A Reassessment of Flexible Price Evidence Using Scanner Data: Evidence from an Emerging Economy
Gastón Chaumont, Miguel Fuentes, Felipe Labbé y Alberto Naudon

DTBC – 640 Agosto 2011
Copper, the Real Exchange Rate and Macroeconomic Fluctuations in Chile
José De Gregorio y Felipe Labbé

DTBC – 639 Agosto 2011
Credit Contraction and International Trade: Evidence From Chilean Exporters
Ari Aisen, Roberto Álvarez, Andrés Sagner y Javier Turén

DTBC – 638 Agosto 2011
Investment Dynamics in a DSGE Model With Heterogeneous Firms and Corporate Taxation
Sergio Salgado I.